Nicholas J. Pester, Ph.D.

Curriculum Vitae

Earth Sciences Division
Lawrence Berkeley National Laboratory
One Cyclotron Road, MS 74R316C
Berkeley, CA 94720, USA

phone (office): (510) 486-6983
phone (lab): (510) 486-4752
phone (mobile): (612) 201-6043
email: njpester@lbl.gov

EDUCATION AND DEVELOPMENT

Lawrence Berkeley National Laboratory, Berkeley, CA, USA — 2012–present
Postdoctoral Fellow - Mentor: Dr. Kevin Knauss

University of Minnesota, Minneapolis, MN, USA — 2005–2012
Ph.D., Geochemistry - Advisor: Dr. William Seyfried, Jr.

Gustavus Adolphus College, St. Peter, MN, USA — 1996–2000
B.A., Geology - Thesis work at Macalester College, St. Paul, MN, USA

University of Edinburgh, Edinburgh, Scotland — 1998–1999
Non-graduating studies - School of Geosciences (full academic year)

RESEARCH

General Research Interests

My research is largely focused on the geochemistry of hydrothermal reactions. I carry out experimental and field investigations pertaining to fluid-mineral equilibria, mass transport of metals and volatile gases and multi-phase behavior in crustal fluids. Specific studies currently include: the chemical evolution of deep-sea hydrothermal vent fluids and the impacts on associated biota, the abiotic synthesis and stability of organic compounds, potential reservoir effects related to geological carbon sequestration or carbon capture and storage, partitioning of tracer gases between brines and supercritical CO_2, the effect of salinity and matrix cations on the mass transfer of transition metals, and the effects of fluid chemistry on sub-critical crack growth in stressed materials/minerals.

Oceanographic Expeditions (Integrated Studies of Deep-Sea Hydrothermal Fields)

Mid-Atlantic Ridge, 26–37°N: Cruise KNOX18RR (*R/V Roger Revelle, ROV Jason II*) — 2008

East Pacific Rise, 9–13°N: Cruise AT-15-28 (*R/V Atlantis, DSV Alvin*) — 2008
Port (lead) scientist aboard *Alvin* dive 4392.

Main Endeavour Field, Juan de Fuca Ridge: Cruise AT-11-31 (*R/V Atlantis, DSV Alvin*) 2005
Starboard scientist aboard *Alvin* dive 4142

Galapagos Rift: Cruise AT-11-27 (*R/V Atlantis, DSV Alvin*) 2005

TEACHING EXPERIENCE

Guest Lecturer
Oceanography (1006), University of Minnesota, MN, USA 2009–2012
Oceanography (1120), Normandale Comm. College, MN, USA 2009
Geochemical Modeling (5351), University of Minnesota, MN, USA 2008

Writing Instructor
Geochemical Principles (3303W), University of Minnesota, MN, USA 2010

Teaching Assistant
Oceanography (1006), University of Minnesota, MN, USA 2009–2012
Geochemical Modeling (5351), University of Minnesota, MN, USA 2008

Laboratory Instructor
Oceanography (1006), University of Minnesota, MN, USA 2006–2009
Geology and Cinema (1005), University of Minnesota, MN, USA 2009
Earth and Its Environments (1001), University of Minnesota, MN, USA 2005–2006

Laboratory Curator
Oceanography (1006), University of Minnesota, MN, USA 2007–2009

Course Curriculum Development

- Authored/compiled new Oceanography (1006, Univ. of MN) lab manual (2007)
- Planned lecture topics and student exercises for a new Geochemical Modeling course (5351, Univ. of MN, 2008)

Undergraduate Mentoring

- Annually hosted/sponsored a NSF-REU summer research intern (2006–2011)
- Successfully collaborated with a College of Biological Sciences (Univ. of MN) student in funding an Undergraduate Research Opportunity (UROP) in our lab, proposal entitled: *Pyrite oxidation under deep-sea hydrothermal conditions: Potential for the production of hydrogen peroxide* (2009)

AWARDS AND HONORS

Outstanding Student Paper Award (oral presentation), AGU Fall Meeting 2008
William Emmons Fellowship, Univ. of MN 2007–2008
Richard Clarence Dennis Graduate Fellowship, Univ. of MN 2007–2008

Kimball Forrest Fellowship, Univ. of MN 2008–2009
Goldschmidt Student Travel Grant, Geochemical Society 2010, 2011, 2012

Invited Speaker: 21st Annual V.M. Goldschmidt Conference, Prague, Czech Republic 2011
Invited Speaker: Geology Seminar, Carleton College, MN, USA 2010
Invited Speaker: Hard Rock Seminar, University of Minnesota, MN, USA 2009
Invited Speaker: Soft Rock Seminar, University of Minnesota, MN, USA 2008

PROFESSIONAL MEMBERSHIPS

American Geophysical Union
Geochemical Society
Geological Society of America

ARTICLES SUBMITTED OR IN PREPARATION

Syverson, D. D., **N. J. Pester**, P. R. Craddock, W. E. Seyfried, Jr. (2013), Fe isotope fractionation during phase separation in the NaCl-H_2O system: An experimental study with implications for seafloor hydrothermal systems, *Earth and Planetary Science Letters* (submitted).

Pester, N. J., K. Ding, W. E. Seyfried, Jr., Vapor-liquid and vapor-halite partitioning of alkaline earth and transition metals in NaCl-dominated hydrothermal fluids: An experimental study at 360 – 465 °C, for submission to *Geochimica et Cosmochimica Acta*.

Pester, N. J., W. E. Seyfried, Jr., Abiotic formation of CO and light hydrocarbons from precursor CO_2 and H_2 using a hydrothermal flow apparatus: Water-gas-shift equilibrium and rates of CH_4 synthesis, for submission to *Geochimica et Cosmochimica Acta*.

PEER-REVIEWED PUBLICATIONS

Pester, N. J., K. Ding, W. E. Seyfried, Jr. (2014), Magmatic eruptions and iron volatility in deep-sea hydrothermal fluids, *Geology* (in press).

Pester, N. J., E. P. Reeves, M. E. Rough, K. Ding, J. S. Seewald, W. E. Seyfried, Jr. (2012), Subseafloor phase equilibria in high-temperature hydrothermal fluids of the Lucky Strike Seamount (Mid-Atlantic Ridge, 37°17'N), *Geochimica et Cosmochimica Acta*, 90, 303-322.

Brant, C., L. A. Coogan, K. M. Gillis, W. E. Seyfried, **N. J. Pester**, J. Spence (2012), Lithium and Li-isotopes in young altered upper oceanic crust from the East Pacific Rise, *Geochimica et Cosmochimica Acta*, 96, 272-293.

Pester, N. J., M. E. Rough, K. Ding, W. E. Seyfried, Jr. (2011), A new Fe/Mn geothermometer for hydrothermal systems: Implications for high-salinity fluids at 13°N on the East Pacific Rise. *Geochimica et Cosmochimica Acta*, 75, 7881-7892.

Wu, S., C. Yang, **N. Pester**, Y. Chen (2011), A new hydraulically actuated titanium sampling valve for a deep-sea hydrothermal fluid sampler. *IEEE Journal of Oceanic Engineering*, 36, 462-469.

Seyfried W. E., Jr., **N. J. Pester**, K. Ding, M. Rough (2011), Vent fluid chemistry of the Rainbow hydrothermal system (36°N, MAR): Phase equilibria and in-situ pH controls on subseafloor alteration processes. *Geochimica et Cosmochimica Acta*, 75, 1574-1593.

Seyfried, W. E., Jr., **N. J. Pester**, Fu Qi (2010), Phase equilibria controls on the chemistry of vent fluids from hydrothermal systems on slow spreading ridges: Reactivity of plagioclase and olivine solid solutions and the pH-silica connection, in *Diversity of Hydrothermal Systems on Slow Spreading Ocean Ridges, Geophys. Monogr. Ser., 188*, edited by P. Rona, C. Davey, J. Dyment and B. Murton, pp. 297-320, AGU, Washington, D.C.

Foustoukos, D.I., **N. J. Pester**, K. Ding, W.E. Seyfried, Jr. (2009), Dissolved carbon species in associated diffuse and focused flow hydrothermal vents at the Main Endeavour Field, Juan de Fuca Ridge: Phase equilibria and kinetic constraints, *Geochemistry, Geophysics, Geosystems*, 8, Q10003, doi: 1029/2009/GC002472.

Pester, N. J., D. A. Butterfield, D. I. Foustoukos, K. K. Roe, K. Ding, T. M. Shank, W. E. Seyfried, Jr. (2008), The chemistry of diffuse-flow vent fluids on the Galapagos Rift (86°W): Temporal variability and subseafloor phase equilibria controls, in *Magma to Microbe: Modeling Hydrothermal Processes at Oceanic Spreading Centers, Geophys. Monogr. Ser., 178*, edited by R. P. Lowell, J. S. Seewald, M. R. Perfit and A. Metaxas, pp. 123-144, AGU, Washington, D.C.

CONFERENCE PROCEEDINGS/ABSTRACTS

Pester, N. J., A. T. Schaen, W. E. Seyfried, Jr. (2014), Experimental calibration of salinity effects on quartz solubility in near-critical solutions: Implications for hydrothermal circulation in mid-ocean ridges, Abstract accepted for presentation at the 2014 Ocean Sciences Meeting, AGU: Honolulu, HI, USA, 23-28 Feb.

Seyfried, W. E., Jr., **N. J. Pester**, K. Ding (2012), Ultramafic-hosted hydrothermal systems at mid-ocean ridges: Serpentinization, chloritization and geochemical controls on mass-transfer processes (*invited*), Abstract V52A-01 presented at the 2012 Fall Meeting, AGU: San Francisco, CA, USA, 3-7 Dec.

Pester, N. J., K. Ding, W. E. Seyfried, Jr. (2012), Experimental vapor-liquid partitioning of transition metals in NaCl dominated fluids, *Mineralogical Magazine*, 76(6) 2223. Paper presented at the 22nd V.M. Goldschmidt conference, Montreal, Canada, 25-29 Jun.

Pester, N. J., W. E. Seyfried, Jr. (2011), Kinetic and thermodynamic controls on the concentration of carbon gases in hydrothermal fluids, *GSA Abstracts with Programs*, 43, 532. Paper 220-11 presented at the GSA annual meeting and exposition, Minneapolis, MN, USA, 9-12 Oct.

Pester, N. J., W. E. Seyfried, Jr. (2011), Abiogenic formation of carbon species at hydrothermal conditions using a novel flow apparatus, *Mineralogical Magazine*, 75(3), 1626. Paper presented at the 21st V.M. Goldschmidt conference, Prague, Czech Republic, 14-19 Aug. (**invited presentation)**

Pester, N.J., W. E. Seyfried, Jr. (2010), Vapor-liquid partitioning of iron and manganese in hydrothermal fluids: An experimental investigation with application to the integrated study of basalt-hosted hydrothermal systems, Abstract OS14A-03 presented at the 2010 Fall Meeting, AGU: San Francisco, CA, USA, 13-17 Dec.

Pester, N. J., M. E. Rough, K. Ding, W. E. Seyfried, Jr. (2010), Phase equilibria controls on mass transfer reactions in the Rainbow hydrothermal system, *Geochimica et Cosmochimica Acta*, 74, A809. Paper presented at the 20th V.M. Goldschmidt conference, Knoxville, TN, USA, 13-18 Jun.

Ding, K., W. E. Seyfried, Jr., **N. J. Pester**, E. Seyfried (2010), A new approach for deducting in-situ pH value of hydrothermal fluid in the reaction zone at mid-ocean ridges, *Geochimica et Cosmochimica Acta*, 74, A234. Paper presented at the 20th V.M. Goldschmidt conference, Knoxville, TN, USA, 13-18 Jun.

Pester, N. J., W. E. Seyfried, Jr. (2009), Possible phase separation effects on the Na/Ca ratio in mid-ocean ridge hydrothermal vent fluids. Abstract presented at the Ridge 2000 workshop: *Devolping a holistic view of oceanic spreading center processes*, St. Louis, MO, USA, 1-3 Oct.

Pester, N. J., K. Ding, W. E. Seyfried, Jr. (2009), Recent hydrothermal fluid chemistry from EPR 13°N: Phase equilibria constraints with applicability to the integrated study of basalt-hosted

hydrothermal systems, *Eos, Trans. Am. Geophys. Union*, 90 (52), Fall Meet. Suppl., Abstract OS12A-05 presented at the annual fall meeting of the American Geophysical Union, San Francisco, CA, USA, 14-18 Dec.

Pester, N. J., M. Rough, K. Ding, W. E. Seyfried, Jr. (2008), Phase equilibria controls on fluid chemistry at the Lucky Strike hydrothermal field, Mid-Atlantic Ridge, *Eos, Trans. Am. Geophys. Union*, 89 (53), Fall Meet. Suppl., Abstract V54B-06 presented at the annual fall meeting of the American Geophysical Union, San Francisco, CA, USA, 15-19 Dec**. (Winner of Outstanding Student Presentation Award)**

Seyfried, W. E., Jr., K. Ding, **N. Pester**, Q. Fu. (2008), Geochemical controls on the composition of hydrothermal vent fluids at EPR 9°N: pH and redox constraints from in situ chemical sensor deployments and experimental and theoretical model results (*invited*), *Eos, Trans. Am. Geophys. Union*, 89 (53), Fall Meet. Suppl., Abstract V44B-04 presented at the annual fall meeting of the American Geophysical Union, San Francisco, CA, USA, 15-19 Dec.

Ding, K., W. E. Seyfried, **N. Pester**, E. Seyfried (2008), In-situ measurement of pH of hydrothermal vent fluids at EPR 9°N: Implications for acidity in subseafloor reaction zones, *Eos, Trans. Am. Geophys. Union*, 89 (53), Fall Meet. Suppl., Abstract B21A-0333 presented at the annual fall meeting of the American Geophysical Union, San Francisco, CA, USA, 15-19 Dec.

Pester, N. J., D. A. Butterfield, D. I. Foustoukos, K. K. Roe, K. Ding, T. M. Shank, W. E. Seyfried, Jr. (2007), The chemistry of diffuse-flow vent fluids on the Galapagos Rift (86°W): Temporal variability and subseafloor phase equilibria controls, *Geochimica et Cosmochimica Acta*, 71, A780. Paper presented at the 17th V.M. Goldschmidt conference, Cologne, Germany, 19-24 Aug.

Foustoukos, D. I., W. E. Seyfried, K. Ding, **N. Pester** (2006), Dissolved carbon species in diffuse and focused flow hydrothermal vents at the Main Endeavour Field, Northern Juan de Fuca Ridge, *Eos, Trans. Am. Geophys. Union*, 87 (52), Fall Meet. Suppl., Abstract B34A-03 presented at the annual fall meeting of the American Geophysical Union, San Francisco, CA, USA, 11-15 Dec.

Ding, K., W. E. Seyfried, Z. Zhang, D. Foustoukos, **N. J. Pester** (2006), Redox and pH evolution of the subseafloor hydrothermal system at the Main Endeavour Field, JDF: Constraints from time series measurement using in-situ chemical sensors, *Eos, Trans. Am. Geophys. Union*, 87 (52), Fall Meet. Suppl., Abstract B31B-1106 presented at the annual fall meeting of the American Geophysical Union, San Francisco, CA, USA, 11-15 Dec.

Ding, K., W. E. Seyfried, Z. Zhang, D. Foustoukos, **N. J. Pester** (2005), In-situ chemistry of hydrothermal fluids from black smokers in Main Endeavour Field, Juan de Fuca Ridge, *Eos, Trans. Am. Geophys. Union*, 86 (52), Fall Meet. Suppl., Abstract T31A-0488 presented at the annual fall meeting of the American Geophysical Union, San Francisco, CA, USA, 5-9 Dec.